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Correlation in Teaching Biology and Geography

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Abstract

This paper presents a way of possible implementation of teaching process based on interdisciplinary correlation. Interdisciplinary relationship between biology (bird migration) and geography (the basic features of countries through which white storks travel to their wintering grounds in Africa) is suggested in this paper. Such interdisciplinary approach should make the teaching process effective and interesting, especially when realized through group (team) work and cooperative learning. Well-combined forms of work, teaching methods and sources of knowledge lead to a deeper students' understanding of the teaching material and its significance, which ultimately affects students' achievement.

Key words: *biology; bird migration; geography; interdisciplinary correlation.*

Introduction

The approach to the educational work that is based on the interdisciplinary principles can be considered useful and justified if it ultimately leads to effective teaching. The path that leads towards this aim has to be strongly associated with a methodologically well-designed lesson plan, and of course, with well-implemented anticipated educational tasks of the specific teaching material. In Croatian journals there are a small number of papers which discuss the pedagogical justification of the interdisciplinary approach to teaching. However, the conclusions of these articles suggest that various integrative approaches are one of the major ways leading to an effective knowledge acquisition (Polić, 2005; Papotnik et al., 2008).

Within the framework of the teaching material of biology in secondary school (the second year of grammar school) there is the topic *Birds*, a component of the *Chordata* teaching unit. In Croatia, in total, there have currently been recorded 373 species of birds, over 60% (224 species) of which belong to the breeding birds

(Kralj, 1997). With some bird species we find shorter or longer directed (regular) movements of the whole population, which we call migration, and these birds are known as migratory birds. Sedentary birds, on the other hand, do not leave their habitat, while wandering birds perform non-directed movements (nomadism, invasions, irruption), mainly in search of food. Among the best known, and we can freely say favourite of the migratory birds residing in this territory are the white stork and the swallow. In further text, data on the migration of the white stork shall be used, in order to show a possible inter-disciplinary correlation (biology and geography). After nesting, the old and the young storks leave this area (autumn migration) and embark on a journey to the southern regions of Africa. They return in spring (spring migration) and upon the occurrence of favourable environmental conditions begin to nest. They nest once during the breeding season within a year (Dolenec, 2009).

During the migration period they fly thousands of kilometres in one direction, which has been proved by using the method of placing a ring (usually aluminium) on a foot of the bird. The ring is labelled with letters and numbers. The migration of the white stork, as a form of their behaviour, together with their journey across some areas of three continents (Europe, Asia and Africa) can be used as a means to implement interdisciplinary teaching where the "well-combined" biological and geographical content would ultimately lead to an effective knowledge acquisition and understanding. According to Rowlands (2001), special attention should be paid to the pupils' understanding of biology. Therefore, the process of forgetting the previously acquired knowledge will be slower if the teaching material is meaningful, well-connected, and if the correlation between its parts is deeper.

Possible Approach to Teaching Material with Basic Methodological Notes

It has been suggested that the teaching process should be implemented by a biology teacher and a geography teacher working in collaboration. The teaching material would be based on the white stork migration and the geographical features of the countries they fly across on their way to the wintering area in Africa. Our white storks migrate to the southeast direction (bypassing the Mediterranean Sea) and fly over a part of the south Asian continent and, after they have reached Africa, they continue the journey to the south by the River Nile Basin (the white storks of the western part of Europe travel to the southwest and fly over the Mediterranean at Gibraltar, and continue their journey towards central Africa). As an example, the data published in ornithological journal *Larus* (Kralj and Radović, 1999) will be used in this paper. A young white stork ringed in the nest (ring no. TA 661) in the village of Čigoč (Lonja field, $45^0$25' N; $16^0$38'E) on 22 June 1996, was found with the ring on 28 December of the same year in Transvaal (South Africa, $24^0$39'S; $28^0$42'E). It flew about ten thousand kilometres in one direction. The countries which it most likely flew over

were: Bosnia and Herzegovina, Serbia, Bulgaria, Turkey, Syria, Lebanon, Israel, Egypt, Sudan, Uganda, Tanzania, Zambia, Zimbabwe and the wintering area of South Africa (Cramp, 1998). Since the white stork flies over a large number of countries, it has been suggested that the teaching material of Geography comprise only several countries: Bulgaria (as a European country), Egypt (a country on two continents – Asia and Africa), Uganda (a country belonging to the equatorial Africa) and South Africa (the wintering area, the southernmost African country).

Among the sociological forms of work, group work with cooperative learning is proposed. Several papers have shown that cooperative learning significantly affects the expected achievements (e.g. Lord, 2001; Bandiera and Bruno, 2006). Working in groups contributes not only to knowledge acquisition but also to socialization and getting used to working in a team, which is a skill that a lot of pupils will need in their professional life later on (Dolenec, 2003). A group should consist of pupils with mixed abilities. Each group should have the atlas and an access to the Internet. The information on the white stork will be searched on the Internet using the Croatian term – *roda*, English translation – the white stork or scientific term in Latin – *Ciconia ciconia*. Other sources of knowledge that would facilitate the implementation of the proposed interdisciplinary materials, if the school is in possession of such, are also recommended. For example, these may be reference books, CDs and the like. Groups are assigned a variety of tasks (topics) and prepare ten-minute presentations using an LCD projector as their aid:

Group 1: Bird migration – in general
Group 2: The village of Čigoč and white storks
Group 3: Bulgaria (as an example of a European country over which white storks fly) – as the white stork sees it during its flight
Group 4: Egypt – as the white stork sees it during its flight (students draw attention to the River Nile by which the white stork migrates)
Group 5: Uganda – as the white stork sees it during its flight
Group 6: South Africa – as the white stork sees it during its flight (the wintering area).

It is not necessary to give detailed instructions to the groups, but only the basic instructions that would leave pupils plenty of room for their self-initiative and creativity. However, the aim of the task must be explained to the pupils well, as only the full understanding of the aim of the task leads to an effective acquisition of the teaching content (Tobin and Garnett, 1988). If possible, it is best to perform the task without the time limit, but if the learning process is done within the school timetable, at least three lessons are suggested. Generally, the present and the future approach to teaching should be directed to the development of pupils' competences which would "push" into the background didactic materialism (or at least reduce it to the "bearable" extent). Furthermore, the teaching process should, with its openness provide the possibility of a teacher and pupil "intervention" regarding the content.

Therefore, it is necessary, among other relevant factors, to direct more attention to interdisciplinary reflection of teaching wherever there is meaningfully related content. Accordingly, during the lesson planning one has to think carefully about a possible occasional (or more frequent) integration of varied teaching content when we evaluate this as didactically and methodologically justified. With this form of teaching pupils are "pushed" from the edge of the teaching process to the centre of the teaching process and thus it stresses their personal responsibility for their own learning, thereby creating preconditions of high quality for competence development aimed at successful education.

Instead of Conclusion

In an article published in the Journal of Biological Education (Tronter, 2004) the answer to the question: "Why is biology in many schools dull, lifeless and boring?" is sought. The "remedy" against dullness, among others, may be found in an occasional effective interdisciplinary correlated teaching content. Let's check it!

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Korelacija u nastavi biologije i geografije

Sažetak

U ovome je članku dan prikaz moguće realizacije nastave utemeljene na međupredmetnoj korelaciji. Predlaže se mađupredmetni suodnos biologije (selidba ptica) i geografije (osnovna obilježja država kojima rode putuju do svojih zimovališta u Africi). Takav interdicsiplinarni pristup trebao bi nastavu učiniti učinkovitom i zanimljivom uz grupni (timski) rad i kooperativno učenje. Kvalitetno „umreženje" oblika rada, nastavnih metoda i izvora znanja vodi dubljem učeničkom razumijevanju, kao i dubljem shvaćanju smislenosti nastavnog gradiva, što u konačnici utječe na učenička postignuća.

Ključne riječi: *biologija; geografija; međupredmetna korelacija; selidba ptica*

Uvod

Pristup odgojno-obrazovnom radu koji polazi od načela interdisciplinarnosti, odnosno integracije smisleno povezanih sadržaja dvije ili više znanstvenih disciplina, možemo smatrati korisnim i opravdanim ako u konačnici vodi učinkovitoj nastavi. Put koji vodi tome cilju mora biti čvrsto povezan s kvalitetno metodički osmišljenom pripremom, i dakako, s kvalitetnom realizacijom svih predviđenih odgojnih i obrazovnih zadataka konkretnog gradiva. U našim časopisima nalazimo mali broj radova koji raspravljaju o pedagoškoj opravdanosti ili neopravdanosti međupredmetnog pristupa u nastavi. Međutim, zaključci i iz tog malog broja članaka sugeriraju da su različiti integrativni pristupi jedan od važnijih putova koji vode učinkovitom stjecanju znanja (npr. Polić 2005; Papotnik i sur., 2008).

U sklopu nastavnog gradiva predmeta biologija za gimnazije (drugi razred) nalazi se tema – *Ptice* – kao jedna od sastavnica nastavne cjeline – *Svitkovci*. U Hrvatskoj su ukupno do sada zabilježene 373 vrste ptica od kojih više od 60% pripadaju pticama gnjezdaricama – 224 vrste (Kralj, 1997). U dijelu ptičjih vrsta nalazimo kraća ili dulja usmjerena kretanja cijelih populacija koja nazivamo selidbom, a te ptice imenujemo pticama selicama. Stanarice su ptice koje ne napuštaju svoja obitavališta, dok ptice skitalice obavljaju neusmjerena kretanja uglavnom u potrazi za hranom. Među

najpoznatijim i možemo slobodno reći najomiljenijim pticama selicama u nas su roda i lastavica. U daljnjem tekstu bit će upotrijebljeni podaci o selidbi roda koji će poslužiti za prikaz mogućeg međupredmentnog suodnosa (biologije i geografije). Nakon gniježđenja, stare i mlade rode nas napuštaju (jesenska selidba) i kreću na put prema južnim područjima Afrike. Vraćaju se u proljeće (proljetna selidba) i pojavom povoljnih ekoloških uvjeta počinju se gnijezditi. Gnijezde se jednom u sezoni razmnožavanja unutar jedne godine (Dolenec, 2009). Tijekom selidbe samo u jednom smjeru prelete više tisuća kilometara, što je dokazano metodom prstenovanja – stavljanja metalnog (najčešće aluminijskog) prstena označenog slovima i brojkama ptici na nogu. Selidba roda kao jedan od oblika njihova ponašanja i njihov let preko nekih područja triju kontinenata (Europe, Azije i Afrike) može poslužiti ustroju međupredmetne nastave u kojoj bi „umreženje" bioloških i geografskih sadržaja u konačnici dovelo do kvalitetnog usvajanja i *razumijevanja* gradiva. Prema Rowlandsu (2001) posebnu je pozornost potrebno usmjeriti na učenikovo biološko razumijevanje. Zaboravljanje će u učenice/učenika biti sporije ako je obrada gradiva *smislena*, dobro povezana i ako su odnosi među dijelovima dublje zahvaćeni.

Mogući pristup obradi s osnovnim metodičkim napomenama

Predlaže se da nastavu zajedno realiziraju profesorica/profesor biologije i profesorica / profesor geografije. Nastavno bi se gradivo temeljilo na selidbi roda i geografskim obilježjima država kroz koje lete do svojih zimovališta u Africi. Naše rode sele se u jugoistočnom smjeru (zaobilaze Sredozemno more) te lete dijelom zapadnoazijskog kontinenta i nakon dolaska u Afriku nastavljaju put prema jugu držeći se u pravilu porječja rijeke Nil (rode zapadnog dijela Europe putuju prema jugozapadu te Sredozemno more prelijeću kod Gibraltara i nastavljaju letjeti prema središnjoj Africi). Kao primjer u ovom će radu biti upotrijebljen podatak objavljen u ornitološkom časopisu *Larus* (Kralj i Radović, 1999). Mlada roda prstenovana u gnijezdu (broj prstena: TA 661) u selu Čigoč (Lonjsko polje, $45^0$25' N; $16^0$38'E) 22. lipnja 1996. godine, pronađena je s prstenom 28. prosinca iste godine na području Transvala (Južnoafrička Republika, $24^0$39'S; $28^0$42'E). Preletjela je u jednom smjeru oko deset tisuća kilometara. Zemlje kroz koje je najvjerojatnije letjela jesu: Bosna i Hercegovina, Srbija, Bugarska, Turska, Sirija, Libanon, Izrael, Egipat, Sudan, Uganda, Tanzanija, Zambija, Zimbabve i zemlja zimovanja Južnoafrička Republika (Cramp, 1998). Budući da leti preko velikog broja zemalja, predlaže se da se geografska obrada obavi samo za dio zemalja: Bugarska (kao država Europe), Egipat (država na dva kontinenta – Azija i Afrika), Uganda (država ekvatorijalne Afrike) i Južnoafrička Republika (područje zimovanja, najjužnija država Afrike).

Od sociooloških oblika rada predlaže se grupni rad uz suradničko (kooperativno) učenje. Više je radova pokazalo da suradničko učenje znatno utječe na očekivana postignuća (npr. Lord, 2001; Bandiera i Bruno, 2006). Rad u grupi osim u stjecanju znanja doprinosi socijalizaciji, odnosno navikavanju na timski rad s kojim će se mnoge

učenice/mnogi učenici susresti u sklopu određene djelatnosti tijekom svodaljnjeg života (Dolenec, 2003). Grupu neka čine učenice/učenici različitih razina sposobnosti. Svaka grupa trebala bi imati pristup internetu i atlas. Podatke o rodi potražit će na internetu pod hrvatskim nazivom – *roda*, engleskim nazivom – *white stork* ili latinskim znanstvenim nazivom – *Ciconia ciconia.* Preporučuju se i ostali izvori znanja koji bi pomogli realizaciji predloženog međupredmetnog gradiva, ako su u posjedu škole. To npr. mogu biti priručnici, CD-i i slično. Grupe dobivaju različite zadatke (teme) i pripremaju desetominutna izlaganja služeći se LCD-projektorom kao pomagalom:

1. grupa: Selidba ptica – općenito
2. grupa: Selo Čigoč i rode
3. grupa: Bugarska (kao primjer europske zemlje kojom prolaze rode) – kako je roda vidi tijekom leta
4. grupa: Egipat – kako ga roda vidi tijekom leta (učenicima skrenutu pozornost na rijeku Nil uz koju rode lete)
5. grupa: Uganda – kako je roda vidi tijekom leta
6. grupa: Južnoafrička Republika – kako je roda vidi tijekom leta (područje zimovanja)

Grupama nije potrebno dati detaljne upute već samo osnovne napomene kako bi se ostavilo dosta prostora za samoinicijativnost i kreativnost. Međutim, učenicama/učenicima mora biti dobro objašnjen cilj rada jer samo potpuno *shvaćanje cilja* rada vodi kvalitetnom usvajanju nastavnih sadržaja (Tobin i Garnett, 1988). Ako je moguće, najbolje je da se ponuđeni sadržaji obrade bez vremenskog okvira, a ako se obrada odvija unutar školske satnice, predlažu se najmanje tri nastavna sata.

Općenito, današnji i budući pristup nastavi trebao bi biti usmjeren na što naglašeniji razvoj učeničkih kompetencija, čime bi se u drugi plan „gurnuo" didaktički materijalizam (ili barem sveo na ‚podnošljivu' mjeru). Nadalje, nastava bi svojom otvorenošću trebala pružati mogućnost nastavnikove i učeničine/učenikove „intervencije" s obzirom na sadržaj. Zato je potrebno, uz ostale relevantne čimbenike, više pozornosti usmjeriti na *međupredmetno promišljanje* nastave gdje god postoje smisleno povezani sadržaji. Prema tome, tijekom nastavnih priprema potrebno je dobro razmisliti o mogućoj povremenoj (ili češćoj) integraciji pojedinih sadržaja kada se procijeni je to didaktičko-metodički opravdano. Tim oblikom nastave učenicu/učenika „guramo" s ruba nastave u središte nastave i time do izražaja dolazi njegova osobna odgovornost za vlastito učenje, čime se stvaraju kvalitetni preduvjeti razvoja kompetencija usmjerenih na uspješno cjeloživotno obrazovanje.

Umjesto zaključka

U članku objavljenom u časopisu *Journal of Biological Education* (Tronter, 2004) traži se odgovor na pitanje: „Zašto je biologija u mnogim školama jednolična, beživotna i dosadna (*dull, lifeless and boring*)?" Možda je „lijek" protiv jednoličnosti između ostalog i u povremenoj učinkovitoj međupredmetnoj korelaciji nastavnih sadržaja. Provjerimo!